PreCam, a Precursor Observational Campaign for Calibration of the Dark Energy Survey

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PreCam, a precursor observational campaign supporting the Dark Energy Survey (DES), is designed to produce a photometric and astrometric catalog of nearly a hundred thousand standard stars within the DES footprint (Fig. 1), while the PreCam instrument also serves as a prototype testbed for the Dark Energy Camera (DECam)'s hardware and software. This catalog represents a potential 100-fold increase in Southern Hemisphere photometric standard stars, and therefore will be an important component in the calibration of the Dark Energy Survey. We provide details on the PreCam instrument's design, construction and testing, as well as results from a subset of the 51 nights of PreCam survey observations on the University of Michigan Department of Astronomy's Curtis-Schmidt telescope at Cerro Tololo Inter-American Observatory. We briefly describe the preliminary data processing pipeline that has been developed for PreCam data and the preliminary results of the instrument performance, as well as astrometry and photometry of a sample of stars previously included in other southern sky surveys (Fig. 2).

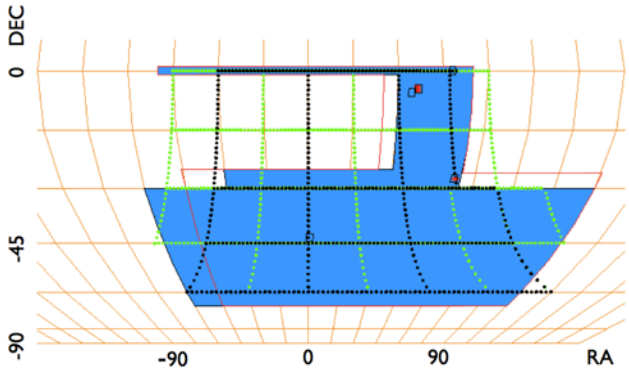

Fig. 1.| The PreCam survey grid (black and green points), overlaid on an earlier proposed version of the DES footprint (blue shaded region with SN fields as small boxes; the most recent footprint has since undergone minor revisions). The grid facilitates the connection of the region of overlap with the SDSS data to the region of overlap with the VHS and SPT data. During standard DES operations, the camera will intersect one of these grid points approximately every 20 minutes throughout the night.

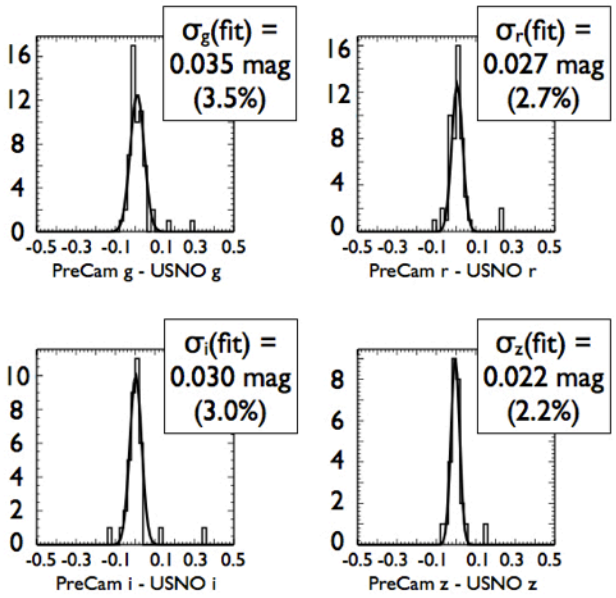

Fig. 2.| Distribution of photometric accuracy of a representative set of stars observed in g-, r-, i-, and z-band images relative to the Equatorial and Southern extensions of the u'g'r'i'z' standard star catalog observed with the U.S. Naval Observatory (USNO) 40 inch telescope. Nearly all stars measured here are between 10th and 15th magnitude. The results show that the fit to the preliminary single-epoch accuracy has a sigma between 2% and 3.5% for these four filters. The final processing and analysis algorithm based on the averaging of multiple images of each field is expected to improve these results to between 1% and 2%.